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(54) **Video camera with head mounted display**

(57) A camera such as a video camera is made up of a number of interconnected units which may be spread about the body for ease of carrying. Preferably a head mounted display 4 is used as the view finder for a camera.



FIG. 1

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FIG. 1



FIG. 2

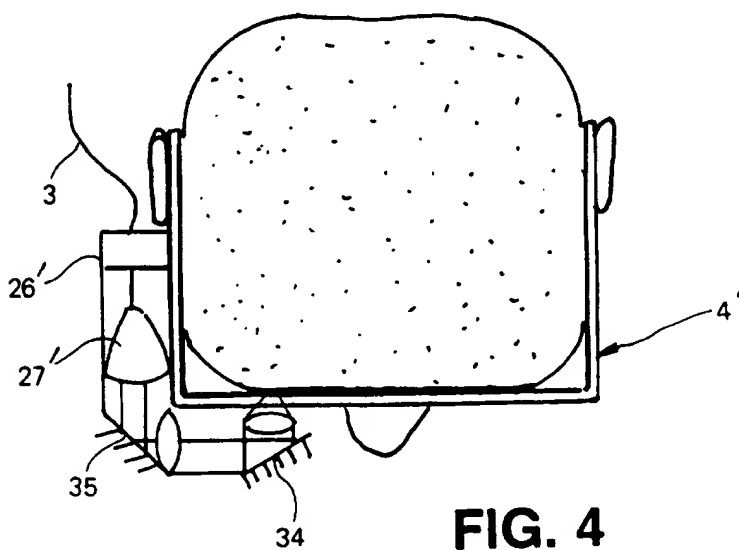


FIG. 4

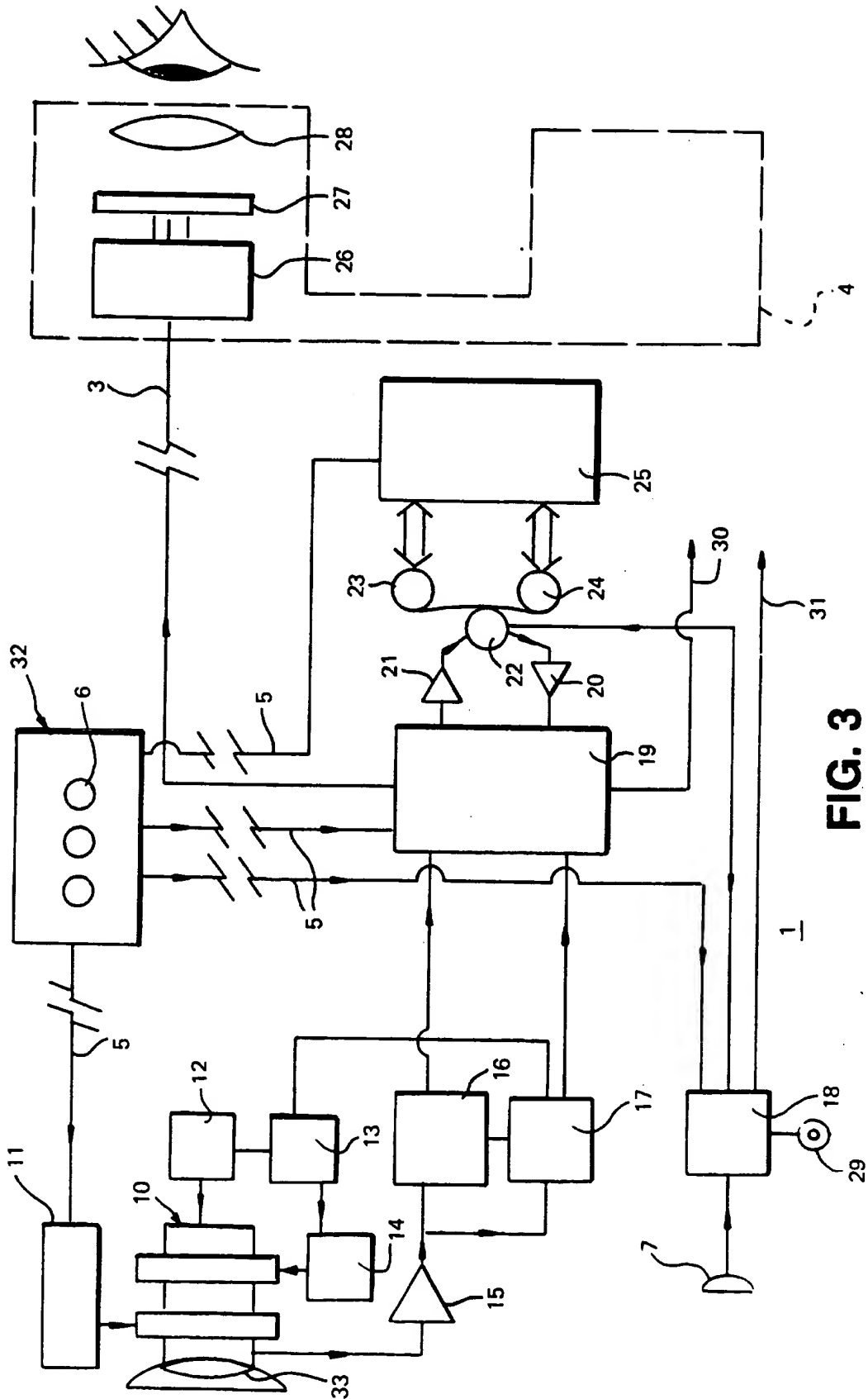


FIG. 3

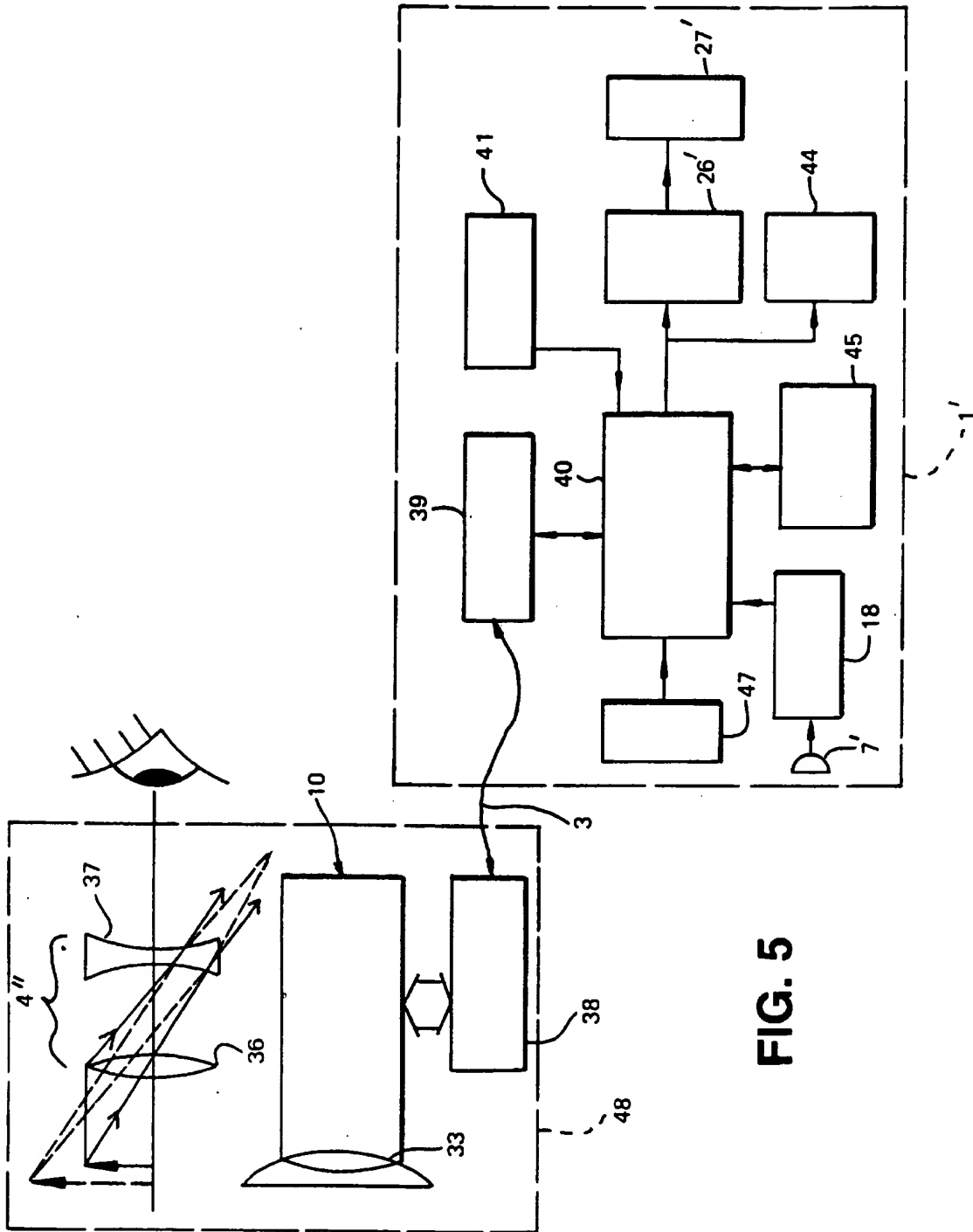


FIG. 5

MULTI-PART CAMERA

The invention relates to a camera. The camera may be a cine camera but it is preferably a video camera adapted to making video cassettes, particularly a camcorder.

A professional cameraman and amateur photographers can carry a video camera on one shoulder, the camera including a viewfinder which the user places in front of the eye to focus on in order to film.

It is one object of this invention to provide a camera which is easier to use by both the professional and the amateur photographer.

Video cameras are often bulky and require some physical effort to use in addition to the skill required to make suitable film.

In recent years, video cameras and video recorders have become miniaturised and have been integrated into the camcorder, which however must be raised to eye level and held with one or both hands in order to film. This can be awkward and inconvenient, particularly when playing with children whilst filming them, or in other situations in which the cameraman takes part in physical activity.

An object of the invention is to overcome or alleviate the above disadvantages.

Accordingly the invention provides a camera having a body portion and a viewfinder connected to the body portion, characterised in that the viewfinder is separate from and freely movable relative to the body portion.

Preferably the body portion comprises at least the picture-taking lens. Preferably the body portion comprises at least 30% (preferably at least 50%) of the total weight of the camera.

In another aspect of the invention, a head-pointed display is used as a viewfinder for a camera. Preferably the viewfinder is an electronic viewfinder and is connected to the body portion by a signal-carrying cable which is sufficiently long e.g. at least 0.4 metres to enable the main body portion to be held at waist level whilst the viewfinder is at eye level. By distributing the components of the camera (e.g. a camcorder) around the body the hands of the photographer are freed. By arranging the eye piece in front of the eye of the photographer accuracy is improved.

Preferably a control box is connected to the body portion. By providing such a switch mechanism, (preferably finger actuated), the photographer has better control over when he starts to film. Better quality films or videos can be produced and there should be less wastage.

Other preferred features are defined in the dependent Claims.

In order that the invention may be well understood, preferred embodiments will now be described by way of example only with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a frontal view of a man carrying a camera of the invention;

Figure 2 is a side elevation of the man shown in Figure 1;

Figure 3 is a block diagram of the camera of Figures 1 and 2;

Figure 4 is a schematic plan view of another viewfinder for use with the camera of

Figures 1 and 3, and

Figure 5 is a schematic block diagram of a further embodiment.

Referring to Figures 1 and 2, the camcorder comprises a main body portion or casing 1 mounted on a waist belt 2 of the wearer. The casing contains the recording mechanism of the camcorder, together with a power pack (which may be a dry cell battery). A cable 3 leads to a head-mounted display or viewfinder 4 which is mounted in the manner of spectacles over one spectacle lens. Another cable 5 leads to an on/off switch having a thumb actuated button 6.

In use the wearer mounts the casing 1 on his belt and wears the spectacles with the viewfinder 4 over one lens. When he wishes to film he simply looks in the right direction and then using his thumb presses the button 6 to actuate filming. The casing also includes a microphone 7 for sound which may similarly be activated. The wearer has his hands free at all times when he is not filming and this enables him to carry on normal activities and where necessary for example to signal to children he wishes to photograph.

Referring now to Figure 3, the camcorder comprises three separate modules, namely: a) the main body portion 1 which includes the picture tube 10 (typically a vidicon or saticon) and its associated zoom lens 33 (indicated purely schematically) as well as the recording and playback mechanism and the bulk of the electronics; b) the control box 32 and its associated control buttons including button 6, and c) the head-mounted display (viewfinder) 4. The display 4 is connected to a video output of the main control board 19 of the main body portion 1 by cable 3, which carries a PAL or NTSC composite video signal to the display. This signal represents the field of view of zoom lens 33. The control box 32 is connected to inputs of main control board 19, a servo-control board 25 which controls the motors 23 and 24 of the tape transport, an audio input board 18 which is connected to microphone 7 and a zoom control block 11 which controls the focal length of the zoom lens.

Picture tube 10 is connected to conventional electronics including flyback control block 12, deflection control block 14, and sync generator 13. The output of the picture tube is fed via a preamplifier 15 to luma block 16 (which extracts the luminance signal) and colour separation block 17 (which extracts the chrominance signals). These signals are fed to main control board 19 which processes them in a conventional manner for recording onto tape via a recording preamplifier 21 and a rotary video head 22. Tapes can be played back in a conventional manner, utilising playback preamplifier 20, all the recording and playback being controlled by the appropriate buttons on control box 32. One composite video output (e.g. PAL or NTSC, according to the requirements of the driver circuitry 26) is connected to the display 4 and the other output 30 can be connected to an external device, e.g. during playback.

Audio board 18, comprising conventional preamplifier and equilisation circuitry, provides an audio output to head 22 as well as an external audio output 31. It also has an input socket 29 for other audio signal sources.

Turning now to display 4, this may be of a commercially available type, but modified if necessary by removing the display options from one eyepiece in order to enable the user to see normally through that eyepiece, the full field of view of lens 33 being displayed by the display options of the other eyepiece. There are represented schematically in Figure 3 and comprise an LCD display 27, associated driver circuitry 26 and a lens arrangement 28 for enabling the user's right eye to focus on LCD display 27.

Figure 4 shows a different display 4' in which a C.R.T. 27' driven by driver circuitry 26' forms an image which is conveyed to the user's right eye by fully silvered mirror 35, partially silvered mirror 34 and associated lenses. In this embodiment the field of view of picture taking zoom lens 33 is superimposed on the user's normal field of view. The C.R.T. and associated electronics are mounted to the side of the user's head on a spectacle-type frame. This embodiment may be modified by providing a corresponding display arrangement (26',27', 34,35) for the left eye as well as the right eye, each display arrangement being fed with the same video signal from cable 3.

In the embodiments discussed above, the cable 3 carries video signals. However the invention also encompasses embodiments in which the display electronics is mounted in the main body portion 1 (or elsewhere on the user's body) and electrical cable 3 is replaced by a fibre optic cable comprising a multiplicity of optic fibres carrying optical signals to an optical viewfinder which is separate from and freely movable relative to the body portion.

Suitable head-mounted displays of various types are available from suppliers such as Virtual Presence Ltd. of 25 Corsham Street, London N1 6DR, UK or from manufacturers such as Liquid Image Corp., 659 Century Street, Winnipeg, Manitoba R3H 0L9, Canada.

In the embodiment of Figure 5, the camcorder comprises two modules linked by a flexible cable 3¹ of 1 or 2m length, namely a main body portion 1¹ and a module 48 which is freely movable relative to the body portion and may be easily held to the user's eye. Module 48 comprises a conventional purely optical eyepiece 4¹¹, comprising a converging objective lens 36 and a diverging eyepiece 37 for example, which is aligned with a lightweight video picture tube 10 having an autoforming lens assembly 33 with two-step zooming. The driver circuitry for the picture tube 10 may be included within module 48 but has been omitted for the sake of clarity.

Module 48 also includes video interface circuitry 38 which outputs video signals to and receives power and control signals from video interface circuitry 39 (in main body portion 1) via cable 3¹. Circuitry 39 is connected to a main circuit board 40 which performs video signal data processing and audio signal data processing and provides motor drive and control signals to a video recorder mechanism 45 (which is suitable for recording and playback of video 8 format or smaller video tapes).

Main circuit board 40 receives power from power supply board 47 (which is suitably associated with a 7.2V re-chargeable battery - not shown) and also receives audio signals from microphone 7¹ via audio circuit board 18¹ and receives control signals from time and remote control circuitry 41, which may include an I.R. receiver to enable remote control from a conventional I.R. remote control unit (not shown).

Main circuit board 40 sends video output signals to an optional liquid crystal display 27¹ via its associated driver circuitry 26¹ to enable simultaneous viewing of the video being recorded, and sends audio and video signals to video cassette recorder interface circuitry 44, which includes standard socketry (not shown) for connection to an external video cassette recorder (not shown).

In a variant display 27¹ and driver circuitry 26¹ may be mounted in a separate headset 4 as shown in Figure 3 and the optical viewfinder 4¹ can be dispensed with, resulting in separate camera, viewfinder and main body portion modules.

The invention is not limited to the embodiments shown. The carrier for the main unit 1 may take a different form, e.g. a holster and a number of holsters may have different components distributed around the belt. The carrier may be looped about the belt or be secured thereto by a hook and loop type fastener such as VELCRO®.

The carrier may be mounted on a shoulder strap or harness. The viewfinder may be for one hand only. Different lenses may be used and the viewfinder may take the form of a neck strap which is lifted by the wearer to the eye when required.

CLAIMS

1. A camera having a body portion (1) and a viewfinder (4) connected to the body portion characterised in that the viewfinder is separate from and freely movable relative to the body portion (1).
2. A camera according to Claim 1 wherein the viewfinder (4) is an electronic viewfinder and is connected to the body portion (1) by a signal-carrying cable (3) which is sufficiently long to enable the main body portion to be held at waist level whilst the viewfinder is at eye level.
3. A camera according to Claim 2 wherein the cable (3) is at least 0.4m long.
4. A camera according to Claim 2 wherein the cable (3) has a length in the range 0.4 m to 2 m.
5. A camera according to any preceding Claim wherein the viewfinder (4) is provided with means for mounting it on the user's head.
6. A camera according to any preceding Claim which is a video camera and wherein the viewfinder (4) is an electronic viewfinder comprising a display (27) for displaying the field of view of the camera.
7. A camera according to any preceding Claim wherein the viewfinder (4¹¹) and a picture-taking lens (33) of the camera are mounted in a common casing.

8. A camera according to any of Claims 1 to 6, wherein the body portion (1) comprises at least a picture-taking lens (37).
9. A camera according to any preceding Claim wherein the body portion (1) comprises at least 30% of the total weight of the camera.
10. A camera according to any preceding Claim further comprising a control box (32) connected to the body portion (1) by a control cable (5).
11. A camera according to any preceding Claim further comprising harness means (2) for supporting the body portion (1) on the user's body.
12. A camera according to Claim 10 which is usable with both hands free.
13. A camera according to any preceding Claim wherein the viewfinder (4') comprises partially reflecting means (34) for superimposing on the field of view of an eye of the user the field of view of the camera.
14. Use of a head-mounted display as a viewfinder for a camera.
15. Use according to Claim 14 wherein the display is monocular.
16. Use according to Claim 14 or Claim 15 wherein the field of view of the camera is superimposed on the field of view of the user's eye.

17. Use according to any of Claims 15 to 16 with both hands free of the camera body and viewfinder.

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| Patents Act 1977 Examiner's report to the Comptroller under Section 17 (The Search report) | | <u>11</u> Application number GB 9515645.1 |
| Relevant Technical Fields (i) UK Cl (Ed.N) H4F (FAAE, FAAP, FAAX, FJL, FJS, FJX) (ii) Int Cl (Ed.6) H04N (5/225, 5/232, 7/18) | | Search Examiner MR J M McCANN |
| Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii) ONLINE: WPI | | Date of completion of Search 9 NOVEMBER 1995 Documents considered relevant following a search in respect of Claims :- 1, 14 |

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|----------|---|----------------------|
| X | GB 2240445 (SAMSUNG) see abstract and Figure 1 | All |
| X, & | EP 0294521 A1 (HAWTHORNE) see abstract and Figure 1 | All |
| X | WO 93/01683 (CAMAIR RESEARCH INC) see abstract and Figure 6 | All |
| X | US 5321456 (YOON) see Figures 1 and 5 | All |
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